

20: CLT-based Confidence Intervals for Means

Stat 120 | Fall 2025

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1. (Adapted from Exercise 6.128)

Plastic microparticles contaminate shorelines. Much of the pollution comes from washing fleece clothing. In a recent study, washing a fleece garment discharged on average $\bar{X} = 290$ fibers per liter of wastewater. The standard deviation was $s = 87.6$ fibers and the sample size was $n = 120$.

- What is the estimated *standard error* of the average number of fibers discharged per liter of wastewater when washing a fleece garment?
- The table below gives some percentiles of the t_{119} distribution. Use this information to construct a 99% confidence interval for the population mean. Interpret the interval in context.

percentage	percentile (<code>qnorm(percentage)</code>)
90%	1.3
95%	1.6
97.5%	2.0
99%	2.3
99.5%	2.6

- What sample size would we need if we wanted this interval to be *no wider* than 20?